APPLICATION
FOR
UNITED STATES LETTER PATENT

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Title: **FOLDING KNIFE WITH SPRING ASSISTED PIVOTING FEATURE**

Docket No. **127 P 053**

CAMILLUS CUTLERY COMPANY

I hereby certify that this paper, Fee Transmittal, Utility transmittal 15 pages of specification, declaration, assignment, assignment transmittal, 7 sheets of drawings, and a check in the amount of $810 is being deposited with the United States Postal Services on the date shown below with sufficient postage as Express Mail No. EV 191632311 US in an envelope addressed to Mail Stop Patent Application; Commissioner for Patents PO Box 1450 Alexandria VA 22313-1450 on October 7, 2003

Ann R. Miller
Date: October 7, 2003

Application of: William J. Taylor

For: Folding Blade Knife With Spring Assisted Pivoting Feature

BACKGROUND OF THE INVENTION

[0001] The present invention relates to folding blade knives and, more particularly, to knives having one or more blades pivotally movable between open and closed positions with respect to a handle piece with biasing means assisting in such movement.

[0002] The prior art includes many examples of folding knives wherein a blade is pivotally mounted upon a handle piece for movement for movement between open and closed positions with a spring, wire, or other biasing means assisting in such movement. In one type of spring assisted blade opening, typified by U.S. Patents Nos. 6,145,202, 6,397,476, 5,802,722, and 6,308,420, the blade must be moved manually away from the fully open or fully closed position for a portion of its travel before the biasing element takes effect to complete the blade movement. The biasing element may be in the form of a wire having opposite end portions bent to extend through openings or grooves in the handle and blade, or have a portion engaging a roller mounted upon the blade tang with a central axis parallel to and spaced from the pivot axis of the blade.

[0003] In general, the object of the present invention is to provide a novel and improved folding blade knife having a spring for assisting in pivotal movement of the blade through terminal portions of its travel between the open and closed positions.

[0004] A further object is to provide a knife having a blade pivotally mounted upon a handle piece for movement between fully open and closed positions wherein the blade is moved manually for an initial portion of its travel from one position toward the

other and is then moved by spring action for the remainder of such travel, wherein the knife incorporates novel and improved biasing means providing the assisted blade movement.

[0005] Another object is to provide a folding blade knife having a cantilever spring and cam mechanism for assisting blade movement from partly to fully open and closed positions.

[0006] Other objects will partly be obvious and will partly appear hereinafter.

SUMMARY OF THE INVENTION

[0007] In furtherance of the foregoing objects, the present invention contemplates a knife having a handle portion with a blade pivotally connected thereto for movement between a fully closed position, wherein a portion of the blade including the cutting edge is received between two spaced handle portions, and a fully open position, wherein the blade extends substantially coaxially from the handle. The blade has a sharp point at one end and a tang portion at the other end, with a post defining the axis of rotation of the blade extending through a hole in the tang portion and secured at opposite ends to the spaced handle portions. A cantilever spring is firmly anchored at a fixed end to one of the handle portions within a recess which faces the other handle portion. The spring extends through this recess to a free end having a laterally extending lobe positioned adjacent, but spaced from, the post about which the blade is pivoted. This lobe engages a cam member extending laterally from the tang when the blade is in the closed position and remains in contact with the cam throughout a portion of the blade travel toward the open position. The surface of the cam member which is engaged by the end portion of the spring has a predetermined size and shape such that the spring exerts a

biasing force retaining the blade in the closed position, and, after manual movement of the blade away from the fully closed position for a first portion of its travel, the spring acts upon the cam surface to move the blade through a second portion of its travel toward the fully open position. The momentum developed by spring movement results in inertial movement of the blade through a third portion of its travel to the fully open position wherein it is locked by automatically actuated locking means. Upon manual release of the locking means, the blade may be manually rotated from the fully open to the fully closed position, with the spring acting upon the cam surface over a terminal portion of such movement to assist in moving the blade to, and retaining it in, the fully closed position.

[0008] The foregoing and other features of construction and operation of the folding blade knife of the invention will be more readily understood and fully appreciated from the following detailed disclosure, taken in conjunction with the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1 is a fragmentary side view of the folding blade knife in the fully closed position;

[0010] Figure 2 is a fragmentary side view of the knife of Figure 1 with the blade rotated about one-eighths of its travel away from the fully closed position;

[0011] Figure 3 is a fragmentary side view of the knife with the blade rotated about one-quarter of its travel away from the fully closed position;

[0012] Figure 4 is a fragmentary side view with the blade rotated through about three-quarters of its travel away from the fully closed position, or, conversely, one-quarter of its travel away from the fully closed position;

[0013] Figure 5 is a fragmentary side view with the blade in its fully open position;

[0014] Figures 6 and 7 are top plan views of the knife with the blade in the closed and open positions, respectively;

[0015] Figure 8 is a side view of the side of the knife opposite the side shown in Figures 1 through 5, with the blade in the fully closed position;

[0016] Figure 9 is a side view of the side opposite Figure 8 with portions removed;

[0017] Figure 10 is an exploded perspective view; and

[0018] Figure 11 is a fragmentary, perspective view of a portion of the knife with the blade in an intermediate position of travel.

DETAILED DESCRIPTION

[0019] The folding knife of the invention is shown in the fully closed position as seen from one side, termed the right side, in Figure 1 and from the left side in Figure 8. Blade 10 is mounted for pivotal movement about the central axis of pivot pin 12 with respect to the handle, consisting of right handle piece 14 (Fig. 1) and left handle piece 16 (Fig. 8). Handle pieces 14 and 16 are held in spaced relation by a plurality of threaded fasteners 18 and spacers 20 (Fig. 10). Thus, each of handle pieces 14 and 16 has an inwardly and an outwardly facing surface, the outwardly facing surfaces being seen in Figures 1 and 8, and the inwardly facing or opposed surfaces being seen in Figures 9 and

10. In the illustrated model, handle pieces 14 and 16 are constructed of metal and the outwardly facing surface of each is machined to provide a raised, decorative portion extending longitudinally along generally the central area, flanked on each side by outward surface portions where metal has been removed, although this is not considered any part of the inventive features of the knife. Blade 10 is provided with a sharpened edge 22, a point 24 at one end and integral tang 26 at the other end.

[0020] In the fully closed position, a portion of blade 10 including edge 22 and point 24 is positioned in the space between handle pieces 14 and 16. Blade 10 is shown in Figure 2 rotated about the axis of pin 12 to a position wherein the longitudinal axes of the blade and handle are disposed at an angle of about 20°. In Figures 3 and 4 the angle between the axes of the blade and handle are about 40° and 135°, respectively. The knife is shown in Figure 5 with the blade in the fully open position, extending outwardly from the handle at the limit of its outward rotational travel, i.e., at an angle of 170° to 180°, depending on design preference. Limit pin 28 is affixed to tang 26, extending outwardly from opposite sides thereof. Curved surfaces 30, 30' are formed on handle piece 14 on opposite sides of pivot pin 12, and curved surfaces 32, 32' are formed on handle piece 16. One side of limit pin 28 contact surfaces 30 and 32 to define the fully closed position of blade 10, i.e., the limit of blade rotation in a counterclockwise direction as viewed in Figures 1-5. Likewise, the opposite side of limit pin 28 contacts surfaces 30' and 32' to limit clockwise rotation, thus defining the fully open position (Fig. 5) of the blade.

[0021] As seen in Figure 10, a recess, indicated generally by referenced numeral 34, is formed in the inwardly facing surface of handle piece 14 and extends for most of the axial length thereof. Cantilever or beam spring 36 is positioned in recess 34, the

spring preferably having a thickness substantially equal to the depth of the recess, whereby adjacent surfaces of the spring and handle piece are essentially coplanar. One end 36a of spring 36 is positioned in a portion of recess 34 having an outline corresponding to that of end 36a and one of threaded fasteners 18 passes through an opening in the spring to fixedly anchor end 36a. Free end 36b of spring 36 extends from recess 34 in handle piece 14; free end 36b includes lobe 36c on one side thereof. Cam pin 40 is affixed to tang 26 (or may be formed integrally therewith) and extends outwardly from one side thereof at a position spaced from (eccentric to) the axis of pivot pin 12. Thus, as blade 10 rotates between its closed and open positions, cam pin 40 travels arcuately about pivot pin 12. In the preferred embodiment, cam pin 40 has a pair of rounded ends with a lateral surface, i.e., the surface facing away from pivot pin 12, extending arcuately about the axis of the pivot pin. End 36b of spring 36 is in the path of movement of, and is contacted by, cam pin 40 over a portion of the rotational movement of blade 10, extending from the fully closed position of the blade to a position wherein the longitudinal axes of the blade and handle are disposed at an angle of about 135°. In the closed position, and throughout movement of the blade between the closed position and the aforesaid 135° angle, the lateral surface of cam pin 40 contacts lobe 36c of spring 36. The dimensions and position of cam pin 40 relative to lobe 36c are such that spring 36 is flexed away from a rest (unflexed) position, and thus exerts a biasing force on blade 10, throughout this range of rotation. In the views of Figures 1-4, lobe 36c is contacted by cam pin 40 with end 36b flexed toward the right from the rest position, and as shown in Figure 5, the cam pin is not in contact with lobe 36c (when blade 10 is in its fully open position).

[0022] In the fully closed (Fig. 1) position, lobe 36c contacts cam pin 40 at one of its ends, wherein spring 36 exerts a force on cam pin 40 tending to rotate blade 10 in a counterclockwise direction about pivot pin 12. Limit pin 28 contacts curved surfaces 30 and 32 of handle pieces 14 and 16, respectively, to limit the extent of counterclockwise movement. That is, the closed position of blade 10 is defined by contact of pin 28 with portions of the handle and spring 36 acting upon cam pin 40 to maintain the blade in this position until a manual force is applied to move the blade in a clockwise direction, as viewed in Figures 1-5. After a few degrees of clockwise rotation, the manual force required to overcome the biasing force of spring 36 in the counterclockwise rotation is removed by the change in relative positions of spring lobe 36c and cam pin 40. As seen in Figure 2, lobe 36c now contacts the lateral surface of cam pin 40, and the biasing force of spring 36 is directed upon cam pin 40 in a direction extending substantially through the axis of pivot pin 12. Therefore, blade 10 may be moved in either direction over a certain range, e.g., between about 20° and 40° by only such manual force as is required to overcome friction of the parts. When the blade reaches the position of Figure 3, cam pin 40 has rotated to a position wherein lobe 36c contacts its other end (i.e., the end opposite that contacted when the blade is in the fully closed position, as previously described) and the force of spring 36 tends to rotate blade 10 in the clockwise direction. With no further manual force applied to blade 10, spring 36 will rapidly rotate the blade from the position of Figure 3 to that of Figure 4. Clockwise rotation beyond this point removes cam pin 40 from contact with any portion of spring 36. However, the energy transmitted by spring 36 to blade 10 during movement from the Figure 3 to the Figure 4 position is such that

the momentum or inertia of the blade is sufficient to move the blade to the fully open position.

[0023] In Figures 8-10 it will be noted that a through slot 42, having open and closed ends 42a and 42b, respectively, is cut in handle piece 16 to form portion 16a. A permanent bend is formed to place upper end 16b of portion 16a in a rest (unflexed) position laterally offset from the plane of the adjacent surface of the major portion of handle piece 16. When blade 10 is in any position other than fully open, end 16b is biased toward and contacts tang 26 on its side surface. When blade 10 reaches the fully open position, the biasing force moves end 16b laterally toward the right, as seen in Figure 7, into abutting relation with an opposing surface portion 27 of tang 26. Thus, the fully open position of blade 10 is defined by contact of limit pin 28 with surfaces 30', 32 of the handle pieces and is locked in this position by contact of end 16b of handle portion 16a with portion 27 of tang 26. When it is desired to close the blade, end 16b may be moved laterally by the thumb of one hand until the blade has been rotated a short way from the fully open position, i.e., until the opposing surfaces of tang 26 and end 16b have been moved past one another. The blade may then be manually rotated against only frictional forces until cam pin 40 contacts lobe 36b, approximately at the Figure 4 position, and thereafter rotated against the biasing force of spring 36 until it approaches the fully closed position, i.e., past the Figure 2 position. Lobe 36c will contact the rounded end of cam pin 40 just prior to blade 10 reaching the fully closed position. Thus, while the biasing force of the cantilever spring assists in opening movement over a relatively large portion of blade movement, e.g., 75%, the biasing force in the closing movement is operative over only a relatively small, e.g., <10%, of the range of movement

from fully open to fully closed. However, the biasing force does maintain the blade in the fully closed position until sufficient manual force is applied to overcome the biasing force.